temperature of the concrete to be treated shall be above 4°C [40°F] at the time of application.

515.05 Method of Measurement Protective coating for concrete surfaces will be measured for payment by the square meter [square yard] or lump sum unit as specified, satisfactorily applied and accepted.

515.06 Basis of Payment Protective coating for concrete surfaces will be paid for at the contract unit price per square meter [square yard] or lump sum as specified.

Payment will be made under:

Pay Item		Pay Unit
515.20	Protective Coating for Concrete Surface	square meter [Square Yard]
515.21	Protective Coating for Concrete Surfaces	Lump Sum

SECTION 516 - STYRENE-BUTADIENNE LATEX MODIFIED PORTLAND CEMENT MORTAR AND CONCRETE

Reserved

SECTION 517 - SHOTCRETE

Reserved

SECTION 518 - STRUCTURAL CONCRETE REPAIR

518.01 Description This work shall consist of repairing existing substructure and superstructure structural concrete as shown on the plans and/or as directed by the Resident. Repairing structural concrete shall include removal and disposal of deteriorated concrete, cleaning exposed reinforcing steel by sandblasting and/or wire brushing, and placing repair material. All work shall be in conformance with applicable provisions of Sections 202, 502, and 503. Upward facing surfaces are

defined as any concrete surfaces where the slope is less than or equal to 15%. Vertical surfaces are defined as any concrete surfaces where the slope is between 15% and zero % (plumb), and where the surface is between a slope of zero % (plumb) and is overhanging up to a maximum of 15% from plumb. All other concrete surfaces will be considered overhead surfaces.

518.03 Repair Materials A patching material from the Maine Department of Transportation's list of Prequalified Patching Materials may be used instead of concrete for any depth of placement at the Contractor's option, provided the manufacturer's published recommendations are met. All materials used for repair of concrete or reinforcing steel shall meet the applicable requirements of Division 700 as specified in Standard Specification Sections 502 and 503, respectively. When concrete is used as the repair material, it shall conform to the requirements of Table 1 of Section 502.05 for Class A Concrete.

Where the depth of placement is less than 25 mm [1 in], the repair material used shall be one of the products listed on the Maine Department of Transportation's list of Prequalified Patching Materials.

Where the depth of placement is equal to or greater than 25 mm [1 in], the Contractor may use concrete as the repair material. When concrete is used, the coarse aggregate shall conform to the requirements of the following tables.

	Thickness of Placement		
Coarse Aggregate Gradation Designation	25 - 75 mm [1 - 3 in]	75 - 150 mm [3 - 6 in]	> 150 mm [> 6 in]
SP-1-7	x		
SP-1-78	x		
SP-2-8	x		
SP-2-89	x		
Class AA		x	
Class A or AA		x	x

Coarse Aggregate Gradation Designation	Sieve Designation Percent By Weight Passing a Square Mesh Sieve							
	19 mm [¾ in]	12.5 mm [½ in]	9.5 mm [• in]	4.75 mm [No. 4]	2.36 mm [No. 8]	1.18 mm [No. 16]	300 •m [No. 50]	75 •m [No.200]
SP-1-7	100	90-100	40-70	0-15	0-5	-	-	0-1.5

SP-1-78	100	90-100	40-75	5-25	0-10	0-5	-	0-1.5
SP-2-8		100	85-100	10-30	0-10	0-5	-	0-1.5
SP-2-89		100	90-100	20-55	5-30	0-10	0-5	0-1.5

1. A bonding material shall be used for bonding fresh concrete or patching material to existing hardened concrete. The bonding material shall consist of the following, except that, in the case where Prequalified Patching Materials are used in the repair areas, the manufacturer's published recommendations regarding application and use of bonding materials shall take precedence:

a) For Repair of Concrete Slabs or Repair of Upward Facing Surfaces the bonding grout shall have portland cement and fine aggregate proportioned 1 to 1 by volume. The fine aggregate shall be from the same source as that used in the repair concrete. All material greater than 3 mm [• in] shall be removed from the fine aggregate. The sand and cement shall be measured separately in equal sized containers. The sand shall be added prior to the cement. Water shall be added during the mixing process a little at a time until sufficient water has been added to result in a workable consistency. A workable consistency is defined as the minimum water necessary to allow flow of most of the grout without segregation of the grout ingredients. The Contractor may opt to apply a bonding agent from the Maine Department of Transportation's List of Prequalified Bonding Agents in accordance with the published manufacturer's recommendations.

b) For Repair of Vertical and Overhead Surfaces the Contractor shall apply a bonding agent selected from the Maine Department of Transportation's List of Prequalified Bonding Agents in accordance with the published manufacturer's recommendations.

518.03 Removal of Unsound Concrete Removal of existing concrete shall be accomplished without damage to the portion of the structure that is to remain. The deteriorated or delaminated concrete shall first be removed from areas designated by the Resident. The initial classification of an area as sound concrete does not prevent its subsequent reclassification upon further inspection. After the initial removal of unsound concrete, the Resident shall inspect the area again to determine whether additional areas of unsound concrete were revealed by removal operations and if additional concrete removal is required in the areas to be repaired. This process shall continue until additional areas of unsound concrete are not revealed. After the Resident has determined that the deteriorated concrete has been completely and satisfactorily removed, the perimeter of each cavity created by the removal of concrete shall be saw cut to a minimum depth of 15 mm [• in], unless a lesser depth is required to avoid reinforcing steel. The saw cut shall be approximately perpendicular to the original surface. Edges of the cavity shall not be feathered.

Unless otherwise approved by the Resident, the equipment used for removal of unsound concrete shall be chipping hammers weighing a maximum of 16 kilograms [35 lbs] and only chisel point bits will be allowed.

The surface area and depth of removal for concrete repairs shall be subject to the approval of the Resident.

For Repair of Upward Facing Surfaces, deteriorated concrete shall be removed to one of the following depths, whichever is greatest:

a) Sound substrate.

b) To the minimum depth required per the manufacturer's recommendations, when a Prequalified Patching Material is used.

c) To the minimum depths indicated in the Thickness of Placement Table, when concrete is used, depending on the coarse aggregate gradation.

d) Minimum depth of 25 mm [1 in] behind reinforcing steel when reinforcing is exposed or encountered.

For Repair of Vertical and Overhead Surfaces, deteriorated concrete shall be removed to one of the following depths, whichever is greatest:

a) Sound substrate

b) Minimum depth of 40 mm [1 • in] behind reinforcing steel

518.04 Reinforcing Steel All existing reinforcing steel exposed by concrete removal, which is to remain in the bridge, shall be cleaned of all loose rust by sand blasting, wire brushing or by machine wire brushing. Where reinforcing steel is to remain in the bridge, care shall be taken to prevent damage to the reinforcing steel or its bond to the surrounding concrete.

All existing main reinforcing steel which is broken or has lost 25 percent or more of the original cross sectional area shall be supplemented with reinforcing steel of the same diameter. Supplementary reinforcing steel shall be lapped 30 bar

diameters and wired to the existing steel or, where designated by the Resident, the existing reinforcing steel shall be cut and supplementary reinforcing steel spliced in with tension couplers.

518.05 Surface Preparation The surfaces to receive repair material shall be free of oil, solvent, grease, dirt, loose particles and foreign matter. Cleaning of repair areas shall be performed by sandblasting or other methods approved by the Resident. All surfaces receiving new material are to be sandblasted not more than 36 hours ahead of the placement of the repair material. Any sandblasted areas that have been rained on, exposed to high humidity or fog, or contaminated in any other manner shall be sandblasted again before the repair material is applied. All debris from the cleaning operations shall be thoroughly removed from the cleaned surfaces and adjacent areas using compressed, dry, air, prior to the application of repair materials. All air compressor lines used for cleaning of repair areas shall be equipped with effective oil traps.

518.06 Application of Bonding Agent

1. When bonding grout is used on repair of upward facing surfaces the following shall apply, except that, in the case where Prequalified Patching Materials are used in the repair areas, the manufacturer's published recommendations regarding application and use of bonding materials shall take precedence:
Once a workable consistency has been reached, additional water shall not be added. The grout must be used or discarded within 30 minutes of the time water is added to the mix. The grout shall be applied no greater than 3mm [• in] thick with stiff bristled, nylon, street brooms. The Contractor shall prevent the grout from drying by beginning the grout application immediately prior to the concrete placement and limiting the area of grout application ahead of concrete placement. If the grout begins to dry prior to concrete placement, additional grout may be brushed on the area as directed by the Resident. Should the grout become thoroughly dry it shall be removed by sand blasting or other methods as approved by the Resident.

2. When a bonding agent from the Maine Department of Transportation's List of Prequalified Bonding Agents is used, the bonding agent shall be applied in accordance with the published manufacturer's recommendations.

518.07 Placing Repair Materials When concrete is used as the repair material the provisions of Section 502 of the shall apply. Additionally, concrete shall not be placed when either the ambient air temperature or the existing concrete temperature is below 7 °C [45 °F]. All repair concrete, regardless of quantity, shall be considered Method B unless designated otherwise in the Special Provisions. When a patching material is used, the Contractor shall follow the published manufacturer's recommendations for mixing and placing the material.

Forms shall be erected to the neat lines of the existing structure and the new concrete placed. For overhead and vertical repair areas, sufficient concrete shall be removed to ensure that air within the area to be patched can effectively escape during the placement of the repair material.

518.08 Curing Curing of concrete shall conform to the requirements of Section 502. Curing compounds will not be allowed. Patching materials shall be cured in accordance with the published manufacturer's recommendations.

518.09 Inspection The Contractor shall make provisions to allow safe access to the work for the Resident in order to inspect the work, facilitate ongoing inspection of the work and to measure the work for payment purposes.

518.10 Method of Measurement Repair of structural concrete is divided into repair areas less than 200 mm [7.9 in] in depth and repair areas 200 mm [7.9 in] in depth or greater. The repair depth shall be considered the average thickness of an individual repair area. The Resident shall make the final determination as to whether the average depth of repair is less than 200 mm [7.9 in], or 200 mm [7.9 in] or greater.

Concrete repair will be measured for payment by the square meter [square yard] of all surfaces repaired where the average depth of repair is less than 200 mm [7.9 in], complete and accepted.

Concrete repair will be measured for payment by the cubic meter [cubic yard] for all repairs where the average depth of repair is 200 mm [7.9 in] or greater, complete and accepted. The quantity will be determined by the yield or truck count, in accordance with Section 502.18.
Supplementary reinforcing steel will be measured for payment by the kilograms of steel installed and paid for under item 503.12, Reinforcing Steel, Fabricated and Delivered, and Item 503.13 Reinforcing, Placing, except that Reinforcing Steel, Placing, will be measured for payment as 1.5 times the actual number of kilograms [pounds] placed.

Tension couplers will be measured for payment as the number of splices satisfactorily installed and accepted. Payment will be made under Item 503.17, Mechanical/Welded Splices.

Temporary support beams or girders required to repair bridge seats or pier caps will be paid for separately, as approved by the Resident.

518.11 Basis of Payment The repair of structural concrete will be paid for at the contract unit price as indicated in the Schedule of Items for the respective contract item involved.

Payment for the removal of concrete and the furnishing and placing of new concrete, or other designated repair material, in areas where concrete is removed, will be included in the unit price for the respective concrete repair items.

The cleaning of existing reinforcing steel to remain in the structure shall be incidental to related contract items.

The satisfactory disposal of all removed materials shall be considered as incidental to related contract items.

Payment for furnishing and installing bonding material shall be considered incidental to related contract items.

Payment for any staging, platforms or lifts required by the Contractor to gain access to the work in order to perform the work, or to provide access to the Resident in order to inspect or measure the work, shall be considered incidental to related contract items unless the contract provisions specify separate payment for such access devices.

Fabrication, delivery and placing reinforcing steel, and mechanical couplers if required, will be paid for under separate contract items.

The payment for each contract item will also be full compensation for furnishing all materials, labor, equipment, for all formwork, and for all other incidentals necessary to complete the work.

Payment will be made under:

Pay item	Pay Unit
518.50 Repair of Upward Facing Surfaces- - to Reinforcing Steel, < 200 mm [7.9 in]	M^2 [Square Foot]
518.51 Repair of Upward Facing Surfaces - below Reinforcing Steel, < 200 mm [7.9 in]	M^2 [Square Foot]

518.52 Repair of Upward Facing Surfaces-≥ 200 mm [7.9 in]	M^3 [Cubic Yard]
518.60 Repair of Vertical Surfaces < 200 mm [7.9 in]	M^2 [Square Foot]
518.61 Repair of Vertical Surfaces ≥ 200 mm [7.9 in]	M^3 [Cubic Yard]
518.70 Repair of Overhead Surfaces < 200 mm [7.9 in]	M^2 [Square Foot]
518.71 Repair of Overhead Surfaces ≥ 200 mm [7.9 in]	M^3 [Cubic Yard]

SECTION 519 - VACANT

SECTION 520 - EXPANSION DEVICES - NON-MODULAR

520.01 Description This work shall consist of furnishing and installing expansion devices including the seals, anchorage system and curb, sidewalk expansion dams and barrier sliding plates, where required, as shown on the plans and in accordance with these specifications.

Seals for expansion devices shall be either gland seals or compression seals as specified on the plans.

520.02 Materials Materials shall meet the requirements specified in the following Sections of Division 700 - Materials:

Expansion Device - Gland Seal	
Anchor Studs	711.06
Structural Steel	713.01
High Strength Bolts	713.02
Steel Extrusions	713.08
Elastomer for Seal Elements	714.01
Lubricant-Adhesive	714.03
Gland Type Seals	714.06
Expansion Device - Compression Seal	
Anchor Studs	711.06